Darby Lumber Lands Phase II
DISTANCE Sampling Camera Survey
20 June – 23 August 2017

Prepared by

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Introduction

Darby Lumber Lands Phase II project proposes to commercially harvest about 1,200 acres in Ravalli County, MT, Township 4N, Range 20W, Sections 7, 17-20. Remote sensing cameras (Bushnell HD TrophyCam models 119547 and 119576) were set in a pseudo-random grid to establish baseline densities prior to implementation of proposed project treatments. Establishment of baseline densities will enable direct monitoring of treatment effects to density over time when, or if, post-treatment monitoring with subsequent camera surveys occurs.

Methods

Cameras (N=25) were deployed between 20-21 June 2017 and retrieved between 22-23 August 2017 (figure 1). Cameras were set on suitable trees with a relatively clear field of view near predetermined grid coordinates. Cameras were spaced approximately 0.25 miles apart in ponderosa and Douglas fir habitat types, facing approximately north (0°), about 24 inches above the ground, pointed approximately parallel with the ground surface. Camera placement was selected to specifically avoid effects from trails, roads, and other habitat components that may influence density. No attractants were used. Cameras were set to record 60 second high quality videos, with medium sensitivity, and the smallest delay time between videos.

Analysis followed methods outlined in Howe et al. (2017). One second was used for sampling periods for each species analyzed. Survey effort was calculated for each species by the sum of seconds between the observed daily activity patterns for each species, multiplied by the number of days the camera was functioning at each station. Cameras surveyed a 42° field of view (11.667% of a circle). Therefore a multiplier of $i*(1 / 0.11667)$ was used to estimate density of a radial point except for chipmunks, pine marten, and tree squirrels. For these species the multiplier was set to $i*(1 / 0.05833)$ because of the arboreal habits of these species leading to low detection. Observation at distance 0 was assumed to be 100% except for chipmunks, ground squirrels and tree squirrels, for these species $g0 = 0.5$ because they were small enough to escape detection near the camera.

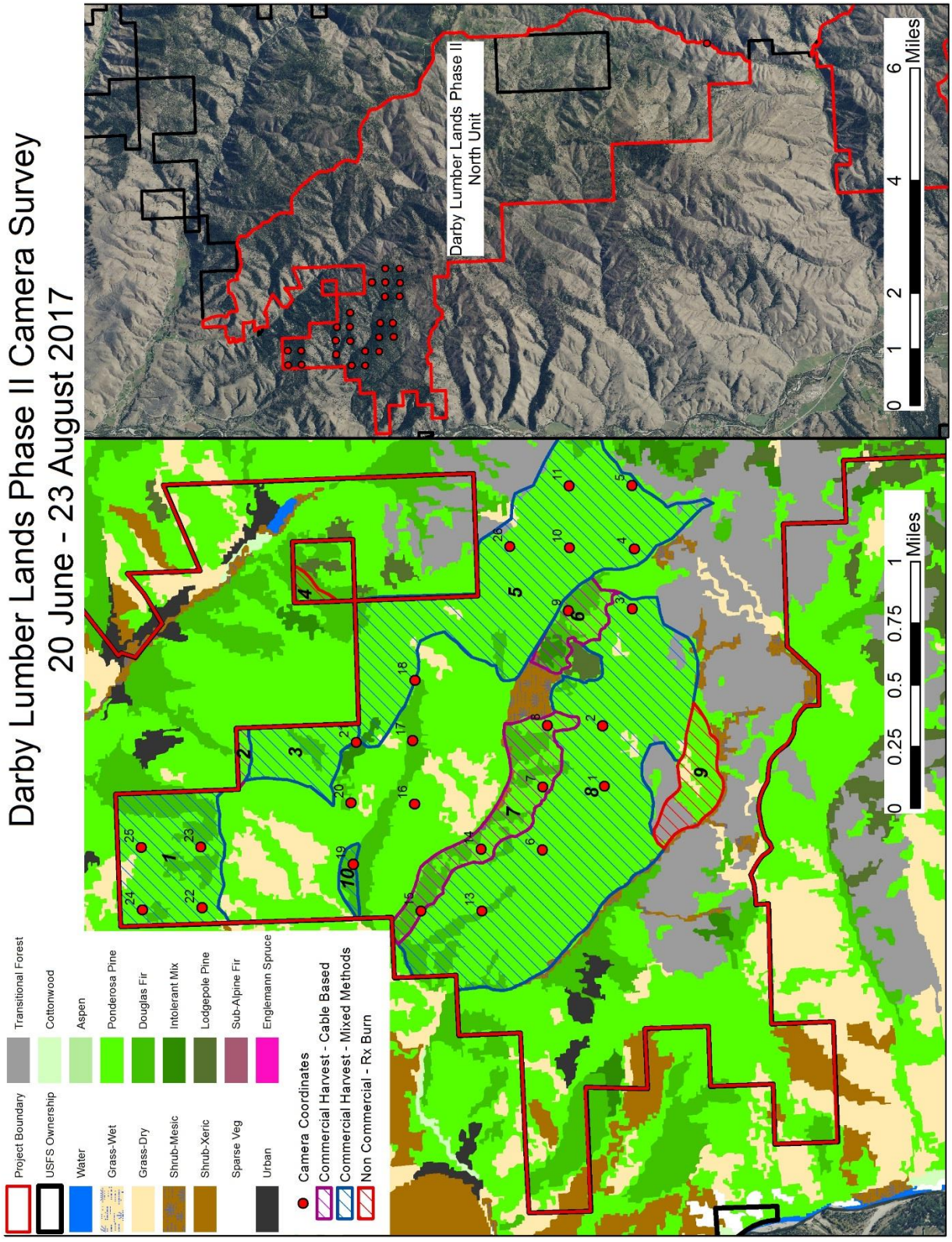

Figure 1. Darby Lumber Lands Phase II DISTANCE Camera Survey 20 June -23 August 2017.

Results

Data was collected by 24 cameras. One camera malfunctioned and failed to collected data. One camera time and date malfunctioned complicating the computation of survey effort. Survey effort for this camera was estimated by assuming the number of days the date reflected was accurate and adding this number to the deployment date. This camera recorded 283 videos. Cameras functionally operated for 1,114.6 camera days, actively monitoring for 26,750.4 hours. Collectively 5,377 videos were recorded equaling 89.61 hours of footage. Survey effort is presented in Table 1.

Table 1. Camera station locations and survey effort between 20 June – 23 August 2017.

Station* #	Camera ID	Northing	Easting	Date Set	Time Set	Date** Picked Up	Time Picked Up	Days	# Videos	Habitat Type
1	WF-24	5108064.9	721947.8	6/20/2017	130700	6/25/2017	142300	5.1	418	Ponderosa
2	WF-29	5108078.0	722340.1	6/21/2017	114100	7/22/2017	125639	31.1	425	Ponderosa
3	WF-06	5107883.8	723106.4	6/20/2017	60500	6/26/2017	143100	6.4	421	Ponderosa
4	WF-16	5107871.4	723499.0	6/21/2017	121800	8/23/2017	115100	63.0	229	Ponderosa
5	WF-28	5107885.2	723909.8	6/21/2017	110700	8/20/2017	223600	60.5	269	Ponderosa
6	WF-25	5108470.8	721531.5	6/20/2017	133400	8/22/2017	122300	63.0	137	Ponderosa
7	WF-30	5108468.2	721944.2	6/20/2017	114300	8/22/2017	82700	62.9	185	Ponderosa
8	WF-08	5108436.8	722343.3	6/20/2017	162600	8/23/2017	133900	63.9	88	Ponderosa
9	WF-05	5108300.0	723092.5	6/21/2017	173600	8/23/2017	141100	62.9	92	Douglas Fir
10	WF-02	5108294.4	723505.5	6/21/2017	115500	8/23/2017	110100	63.0	22	Ponderosa
11	WF-26	5108295.2	723909.1	6/21/2017	121200	6/27/2017	135100	6.1	425	Ponderosa
13	WF-22	5108866.0	721133.8	Camera Malfunction No Data						Douglas Fir
14	WF-12	5108870.9	721536.0	6/21/2017	93200	8/22/2017	130100	62.1	301	Ponderosa
15	WF-15	5109262.4	721132.7	6/21/2017	95200	8/22/2017	114000	62.1	36	Ponderosa
16	16-05	5109305.4	721833.3	6/21/2017	140100	7/17/2017	151400	26.1	678	Ponderosa
17	Stevi-3	5109317.5	722245.4	6/21/2017	142800	8/14/2017	85000	53.8	45	Douglas Fir
18	16-02	5109303.5	722640.1	6/21/2017	93800	8/22/2017	154500	62.3	60	Ponderosa
19***	Stevi-5	5109706.0	721438.2	6/22/2017	140600	7/24/2017	unk	32.0	283	Douglas Fir
20	16-01	5109720.6	721840.8	6/21/2017	164000	8/20/2017	201800	60.2	23	Douglas Fir
21	16-04	5109686.8	722235.0	6/21/2017	152800	8/22/2017	151526	62.0	166	Douglas Fir
22	WF-01	5110693.2	721153.3	6/21/2017	165100	8/23/2017	95000	62.7	33	Ponderosa
23	WF-20	5110700.2	721552.0	6/21/2017	163300	7/11/2017	154200	20.0	424	Ponderosa
24	WF-27	5111082.8	721142.0	6/21/2017	171400	8/23/2017	92900	62.7	29	Ponderosa
25	WF-07	5111090.1	721549.3	6/22/2017	81600	6/25/2017	141200	3.2	432	Ponderosa
26	WF-21	5108683.0	723512.6	6/21/2017	124000	8/18/2017	152100	58.1	156	Ponderosa
Total								1,114.6	5,377	

* There is no station #12

** Date Picked Up or the last day the camera functioned and recorded data

***Date and Time Malfunction

Species were present during 5.62 hours of the 89.61 hours of recorded video. Sixteen species, or groups of species, were documented during the survey. Density estimates for observed species are presented in Table 2.

Table 2. Program DISTANCE density estimates from remote sensing cameras for observed species in the Darby Lumber Lands Phase II project area 20 June – 23 August 2017.

				Observed Activity Patterns			Density Estimate #/square mile				
							Stratified Habitat Type		Overall*		
#	Species	Seconds of Observation	# Stations Detected (N=24)	Begin	End	Daily Detectable Hours	Ponderosa Pine stations (n=19)	Douglas Fir stations (n=5)	Density	Lower Confidence Interval	Upper Confidence Interval
1	Whitetail Deer	8,829	24	12:00 AM	12:00 AM	24	13.94	54.58	19.78	14.79	26.47
2	Elk	5,340	8	2:00 AM	11:00 PM	21	20.83	0.00	16.03	1.81	142.03
3	Cows	1,806	5	3:00 AM	12:00 AM	21	6.00	no obs	4.81	1.65	12.53
4	Tree Squirrels[1]	1,165	6	4:00 PM	2:00 PM	22	33.05	36.87	24.07	10.81	53.55
5	Skunk	683	7	9:00 PM	9:00 AM	12	4.06	no obs	3.07	1.47	6.43
6	Black Bear	665	10	5:00 AM	10:00 PM	17	2.01	3.28	1.58	0.91	2.74
7	Ground Squirrels[2]	631	4	8:00 AM	11:00 PM	15	16.90	0.71	12.65	3.57	44.84
8	Mule Deer	479	7	2:00 AM	11:00 PM	21	0.34	1.71	0.95	0.44	2.05
9	Red Fox	341	9	8:00 PM	2:00 PM	18	0.52	0.14	0.44	0.21	0.93
10	Chipmunks[3]	136	5	6:00 AM	10:00 PM	16	17.18	3.31	9.96	3.94	25.21
11	Mountain Lion[4]	71	2	.	.	24	.	.	0.04	0.01	0.13
12	Pine Marten[5]	70	5	6:00 PM	9:00 AM	15	0.37	no obs	0.28	0.13	0.59
13	Coyote**	11	1	.	.	.	.	.	.	.	.
14	Porcupine**	6	1	.	.	.	.	.	.	.	.
15	Raccoon**	3	1	.	.	.	.	.	.	.	.
16	Rabbit**	3	1	.	.	.	.	.	.	.	.

* Overall density is only estimated for forested habitat types, other habitat types were not surveyed.

** Insufficient data for estimating density.

1 Detectable at only 13 stations, multiplier set to 0.058333 based on undetectable arboreal behavior, and G(0) set to 0.5 based on low detectability, species include: eastern fox squirrel, northern flying squirrel, and red squirrel.

2 Detectable at only 14 stations and G(0) set to 0.75 based on low detectability, species include: Columbian ground squirrel and golden-mantled ground squirrel.

3 Detectable at only 13 stations, multiplier set to 0.058333 based on undetectable arboreal behavior, and G(0) set to 0.5 based on low detectability, species include: least chipmunk, red-tailed chipmunk, and yellow-pine chipmunk.

4 Insufficient data to reliability estimate density of mountain lions, reported because it is a species of interest, daily detectable hours set at 24 based on expert opinion.

5 Insufficient data to reliability estimate density of pine marten, reported because it is a species of interest, multiplier set to 0.058333 based on undetectable arboreal behavior.

Discussion

Most species were estimated to use ponderosa pine habitat at higher density than Douglas fir: chipmunks, cows, elk, ground squirrels, red fox, and skunk. Pine marten were also estimated to use ponderosa pine more than Douglas fir, however there were so few observations that results for this species are not reliable. Despite reservations in the results, pine marten are known to use more open and edge habitats in the summer months. Elk density estimates may be overestimated. At station 4 hundreds of elk observations were recorded from 3 bull elk that routinely laid in front of the camera which was situated on a ridge. No observations of sleeping individuals were recorded and analysis followed Howe et al. (2017). Reanalysis of the data censoring laying down individuals may produce different results.

Black bear, mule deer, whitetail deer, and tree squirrels were estimated to use Douglas fir habitats at greater densities than in ponderosa pine. Current proposed treatments (figure 1) intend to clear-cut Douglas fir stands to promote forest health and increase ponderosa pine extent. These treatments may decrease density of these 4 species in the project area.

Unfortunately there were 6 species for which there was insufficient data to reliably estimate density. Pine marten and mountain lion were 2 of these species for which estimates were provided because they are species of management interest, however density estimates for these 2 species are not reliable and caution should be used in making any management decisions based on these numbers.

This survey only detected 1 rabbit at a ponderosa pine habitat type station. This result is predictable in that little rabbit habitat exists in the project area. The rabbit was likely a mountain cottontail because it appeared to be too small to be a snowshoe hare and there is no suitable habitat for snowshoe hares in the project area.

This survey also provided useful information for species which it did not detect. Wolverine, Canada lynx, fisher, grizzly bear, and bighorn sheep were not documented to use proposed treatment areas during the course of this survey. It is intuitive that species with naturally low population densities will have low detection rates. However, the surveyed area also does not fit the description of suitable habitat for Canada lynx, fisher, or bighorn sheep. The conclusion of this survey, and field observation of habitat, is that these species are not present in the surveyed area.

Grizzly bears are large animals and if they were present in the survey area they would eventually show up on a remote sensing camera. Black bears, with an estimated density of 1.58/mi^2, were captured on camera 21 times at 10 different stations. If grizzly bears have the same detectability as black bears, I would predict one observation at a density of 0.075/mi^2 (or 1 grizzly bear/13.3 mi^2). Mean grizzly bear home range for adult females with cubs in the Greater Yellowstone Area between 1989-2012 is about 60mi^2 (MFWP 2013). If estimated density of black bears remained unchanged with additional observations and grizzly bears were detectable at the same rate, then approximately 290 days of 25 cameras in a survey grid would be needed to detect an adult female grizzly bear with cubs and a home range of 60mi^2. Unfortunately, a 290 day survey window is not feasible given the torpor/hibernation habits of this species. Additional cameras and larger grid spacing would likely reduce the number of day required to detect grizzly bears.

Wolverines are a wide ranging habitat generalist and may not have been present during the course of this survey. Wolverines occur at low densities and passive detection techniques at pseudo-random locations on the landscape have minimal chance of recording observations. Wolverines are detected on the Bitterroot National Forest during the winter months with hair snares and remote sensing cameras using active techniques incorporating scents and roadkill as bait. Because these detections are not random (actively lured to the detection sites) distance statistics cannot be used to estimate density.

This survey has successfully estimated the density of 9 species, or groups of species, in a project area and stratified estimates by 2 habitat types prior to implementation. This survey used 1 employee, 25 cameras, 25 SD memory cards, 250 AA batteries (reused from previous projects), 4 days of field work deploying and retrieving cameras, 8 days of data recording (watching videos), and 1 day of report writing. When replicated, this survey procedure will enable direct comparison of pre-treatment existing conditions with post-treatment conditions over time with minimal resource expenditure.

Literature Cited

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